3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes existing conditions of the physical, biological, cultural, and socioeconomic resources in the WMA. Resources addressed here were identified during the scoping process and interdisciplinary team review.

Critical elements of the human environment that could be affected by any of the alternatives include air and water quality, cultural resources, American Indian traditional values, threatened and endangered species, wetlands/riparian zones, invasive non-native species, prime farmlands, and environmental justice. Five critical elements (Areas of Critical Environmental Concern, wilderness, floodplains, wild and scenic rivers, and hazardous wastes) are not present and are not addressed. The WMA has been privately owned by farmers/ranchers for over 100 years and used to raise crops and livestock. It is similar to the surrounding area in west-central North Dakota. No Areas of Critical Environmental Concern have been identified nor is any of the area considered wilderness. No rivers flow through the WMA so no floodplains or wild and scenic rivers exist. No hazardous waste sites are known to exist in the rural setting of the WMA. In addition to critical elements, the chapter includes discussions of potential impacts on soils, alluvial valley floors, land use/vegetation, wildlife, and socioeconomics.

3.2 SETTING

The WMA lies in the glaciated northern Great Plains, south of the Missouri River. It is characterized by gently rolling uplands covered in glacial deposits and marked by shallow depressions that may hold water seasonally. The landscape is characteristic of terrain where Pleistocene ice sheets deposited glacial till and boulders (also called erratics) on eroded Tertiary bedrock. A noteworthy topographic feature is Antelope Creek and its tributaries, which make up a system of erosional valleys collectively known as the Beulah Trench. These channels carried the Missouri River during ice ages. Bedrock outcrops (usually scoria) underlie the steepest slopes in the WMA. Uplands lie approximately 2,000 feet above sea level, with local topographic relief around 300 feet.

The stratigraphic column of the northern Great Plains is sedimentary in origin, approximately three miles thick, and represents geologic periods from the Cambrian through early Tertiary. Deposition occurred in marine, transitional marine, and terrestrial environments. The near-surface stratigraphy includes Sentinel Butte and Coleharbor Formations. The currently-minable coal seams occur in the Sentinel Butte Formation (Paleocene), which was deposited on swampy floodplains along meandering rivers.

The only economically recoverable coal is the Beulah-Zap seam of the Sentinel Butte Formation. The Beulah-Zap coal is 15 to 22 feet thick in the WMA.

3.3 MINE HISTORY AND OPERATIONS

Coteau began mining and selling coal from the Freedom Mine in 1983; current annual production is about 15.6 million tons. Through year 2000, approximately 220 million tons of lignite coal had been hauled from the Freedom Mine. Coal production from the proposed WMA would be used to meet Coteau's contract obligations with Dakota Coal Company, which supplies Dakota Gasification Company's Synfuels Plant, Basin Electric Power Cooperative's Antelope Valley Station and Leland Olds Station, and Great River Energy's Stanton Station. Electricity generated at these power plants is provided to members of the Basin Electric Cooperative and Great River Energy's member cooperatives.

Coal is removed from the Beulah-Zap seam by surface mining techniques. Overburden removal is accomplished with the use of a truck and shovel fleet, draglines, and tractor scrapers. Overburden is spoiled by the dragline using various techniques. Once all overburden has been removed, the coal surface is cleaned, drilled and blasted. Coal is loaded by shovel or front-end loader and hauled by trucks from the pit to coal hoppers. It is then crushed to a prescribed size and transported to the appropriate customer storage area.

After coal is removed, overburden from the next pit is spoiled into the empty pit and the operation becomes a reclamation project. Mining and reclamation of the WMA would be a continuation of normal operations at Coteau's Freedom Mine.

3.4 AIR QUALITY AND CLIMATE

Air Quality Regulations

The basic framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act and its amendments, and the 1999 Regional Haze Regulations. The Clean Air Act addresses criteria air pollutants, state and national ambient air quality standards for criteria air pollutants and the Prevention of Significant Deterioration program. The Regional Haze Regulations address visibility impairment.

Air Pollutants addressed in this EIS include (1) criteria pollutants, (2) hazardous air pollutants, and (3) sulfur and nitrogen compounds.

Criteria pollutants are those for which national standards of concentration have been established; concentrations greater than these standards represent a risk to human health. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and particulate matter (PM_{10}), and fine particulate matter (PM_{25}).

Particulate matter (e.g., soil particles, hair, and pollen) is essentially the small particles suspended in the air, which settle to the ground slowly and may be re-suspended if disturbed. Separate allowable concentration levels for particulate matter are based on the relative size of the particle: PM_{10}, particles with diameters less than 10 micrometers are small enough to be inhaled and can cause adverse health effects; $PM_{2.5}$ particles with diameters less than 2.5 micrometers are so small that they can be drawn deeply into the lungs and cause serious health problems. These particles are also the main cause of visibility impairment.

Hazardous air pollutants include N-hexane, ethyl benzene, toluene, xylene, formaldehyde and benzene. Although hazardous air pollutants do not have federal standards, they do have "significance thresholds" set by various states and are typically evaluated for potential chronic inhalation and cancer risks. Hazardous air pollutant emissions are associated with industrial activity, including oil and gas operations, refineries, paint facilities, woodworking shops and dry cleaners.

Sulfur and nitrogen compounds that can be deposited on terrestrial and aquatic ecosystems include nitric acid (HNO_3), nitrate (NO_3^-), ammonium (NH_4^+), and sulfate (SO_4^{--}).

The primary pollutant of concern associated with surface mining operations is particulate matter measuring less than 10 micrometers in diameter (PM_{10}).

North Dakota and National Ambient Air Quality Standards

North Dakota Ambient Air Quality Standards (NDAAQS) and National Ambient Air Quality Standards (NAAQS) set the absolute upper limits for criteria air pollutant concentrations at all locations to which the public has access. The NDAAQS and NAAQS are legally enforceable standards. Concentrations above the NDAAQS and NAAQS represent a risk to human health. State standards must be equally or more strict than federal standards, but cannot be less strict.

The EPA has developed standards for each criteria pollutant for a specific averaging time. Short averaging times (one, three, and 24 hours) address short-term exposure, while annual standards address long-term exposure. Annual standards are set to lower allowable concentrations than are short-term standards to recognize the cumulative effects of long-term exposure.

Table 3.1
National And North Dakota Air Quality Standards For Criteria Pollutants

Air Pollutant	Averaging Time	NAAQS µg/m³	NAAQS ppm	NDAAQS µg/m³	NDAAQS ppm
Carbon Monoxide CO	1 hour	40,000	35	40,000	35
	8 hour	10,000	9	10,000	9
Nitrogen Dioxide NO_2	Annual	100	.053	100	.053
Sulfur Dioxide SO_2	1 hour			715	.273
	3 hour	1,300	.5		
	24 hour	365	.14	260	.099
	Annual	80	.03	60	.023
Ozone O_3	1 hour	235	.12	235	.12
	8 hour	157	.08		
Particulate Matter PM_{10}	24 hour	150		150	
	Annual	50		50	
Fine Particulate Matter $PM_{2.5}$	24 hour	65			
	Annual	15			

Prevention of Significant Deterioration

The goal of the Prevention of Significant Deterioration (PSD) program is to ensure that air quality in areas with clean air does not significantly deteriorate, while maintaining a margin for future industrial growth. Under PSD, each area in the United States is classified by the air quality in that region (Table 3.2):

- PSD Class I Areas: Areas with pristine air quality, such as wilderness areas, national parks and areas that are reclassified to Class I (e.g., Indian reservations), are accorded the strictest protection. Only very small incremental increases in concentration are allowed in order to maintain the clean air quality in these areas.

- PSD Class II Areas: Essentially, all areas that are not designated Class I are designated Class II. Moderate incremental increases in concentration are allowed, although the concentrations are not allowed to exceed the concentrations set by North Dakota and federal standards (NDAAQS and NAAQS).

- PSD Class III Areas: No areas have yet been designated Class III. Concentrations would be allowed to

increase more than the Class I and Class II areas; however, concentrations cannot exceed the NDAAQS and NAAQS.

Mandatory PSD Class I areas in the vicinity of Freedom Mine include Theodore Roosevelt National Park and the Lostwood Wilderness Area in North Dakota. Class I areas in Montana include the Medicine Lakes Wilderness Area, and Fort Peck Indian Reservation. The Freedom Mine region and remaining Indian reservations in Montana and the Dakotas are classified as PSD Class II.

Our analysis in Environmental Consequences compares potential air quality impacts from the Proposed Alternative to applicable ambient air quality standards and PSD increments. Comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern for potential impacts and do not represent a regulatory PSD Increment Consumption Analysis. Even though most of the development activities would occur within areas designated PSD Class II, potential impacts on regional Class I areas are evaluated.

Table 3.2
PSD Increments

Pollutant	Averaging Time	PSD Increment Class I µg/m³	Class I ppm	Class II µg/m³	Class II ppm
Nitrogen Dioxide NO_2	Annual	2.5	0.0013	25	0.013
Sulfur Dioxide SO_2	3 hour	25	0.0096	512	0.1956
	24 hour	5	0.0019	91	0.0348
	Annual	2	0.0008	20	0.0076
Particulate Matter PM_{10}	24 hour	8		30	
	Annual	4		17	

Regional Haze Regulations

Visibility impairment is an indicator of air pollutant concentration. Visibility can be defined as the distance one can perceive color, contrast and detail. Fine particulate matter ($PM_{2.5}$) is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the farthest distance a person can distinguish a dark landscape feature from a light background like the sky. Without human-caused visibility impairment, natural visual range would average about 150 miles in the western United States and about 70 miles in the eastern United States.

The EPA developed Regional Haze Regulations in response to the Clean Air Act Amendments of 1990. The regulations are intended to maintain and improve visibility in PSD Class I areas across the United States so that visibility is these areas is returned to natural conditions.

Climate and Meteorology

The climate of the Freedom Mine area is classified as mid-latitude semi-arid steppe (Trewartha and Horn, 1980). Steppe climate is characterized by large seasonal variations in temperature (for example, cold winters and warm summers) and by precipitation levels that are low but still sufficient to support grasses.

Weather data for the Freedom Mine area are available from the state ambient monitoring station located in Beulah, North Dakota. Beulah is at an elevation of 1,785 feet and is about nine miles southeast of the proposed WMA.

Temperature

Annual temperature normal is 43° F in Beulah, North Dakota. Summer highs are usually in the 80s and winter lows are generally in the single digits.

North Dakota temperature data are available for the past 40 years (1961 through 2000). These data show little overall warming or cooling in Beulah, North Dakota (NOAA, 1992 and 2002).

Precipitation

Mean annual precipitation is 17 inches in Beulah. Data from the National Oceanographic and Atmospheric Administration (NOAA) show a very slight drying from the period between 1961 and 1990 to the period between 1971 and 2000. (NOAA, 1992 and 2002).

Dispersion

Atmospheric stability is a measure of the atmosphere's capacity to disperse pollutants. Although stability data are not available for the Freedom Mine, they are available for the Bismarck International Airport, about 70 miles to the southeast. These data indicate that annual dispersion at Bismarck is high (stability classes A, B and C) less than 15 percent of the time, low (stability classes E and F) about 30 percent of the time, and fair (stability class D) about 57 percent of the time (EPA, 1992).

Wind Velocity

Windy conditions are common due to the passage of mid-latitude cyclones and associated fronts compounded by the lack of physical barriers. Prevailing winds are from the north-northwest at an average speed of 12 miles per hour. Winds from the east and southeast are also commonplace.

Air Quality

Elements of air quality addressed in this EIS include concentrations of air pollutants and visibility. Air quality monitoring shows concentrations of air pollutants has remained steady, while coal production has more than doubled during a similar period.

Pollutant Concentrations

Pollutant concentration refers to the mass of pollutant present in a volume of air and can be reported in units of micrograms per cubic meter ($\mu g/m^3$), parts per million (ppm) or parts per billion (ppb). The State of North Dakota has used monitoring and modeling to determine that the Freedom Mine is in compliance with North Dakota and federal concentration standards.

Table 3.3 presents background concentrations for the five criteria pollutants addressed in this analysis. These concentrations are intended to represent air quality conditions in western North Dakota. The table shows background concentration (Monitored Concentration) and as a percentage of applicable federal and North Dakota air quality standards.

Sulfur Dioxide

Sulfur dioxide (SO_2) forms during combustion from trace levels of sulfur in coal or diesel fuel and can convert to ammonium sulfate (NH_3SO_4) and sulfuric acid (H_2SO_4), which can cause visibility impairment and acid rain. Volcanoes are natural sources of SO_2.

The State of North Dakota monitored SO_2 concentrations during 2002 near Dunn Center. The background SO_2 concentrations are about two to four percent of NAAQS.

Other monitoring of sulfur compounds in the Freedom Mine region includes SO_2 concentration monitoring by the Dakota Gasification Company, SO_2 concentration monitoring in Theodore Roosevelt National Park by the State of North Dakota, SO_2 concentration and dry deposition monitoring by the **C**lean **A**ir **S**tatus and **T**rends **Net**work (CASTNet), and precipitation chemistry and wet deposition monitoring by the National Atmospheric Deposition Program (NADP). The State of North Dakota has monitored SO_2 concentration at the Dakota Gasification Company monitoring stations #16 and #17 since 1995. These data show that SO_2 concentrations have been steady and well below the SO_2 NAAQS and NDAAQS from 1995 through 2002.

Table 3.3
Background Concentrations of Criteria Air Pollutants

Pollutant	Averaging Time	Monitored Concentration	Percent NAAQS	Percent NDAAQS
Carbon Monoxide CO	8 hour 1 hour	4.5 ppm 7.2 ppm	50% 21%	50% 21%
Nitrogen Dioxide NO_2	Annual	1.7 ppb	3%	3%
Sulfur Dioxide SO_2	Annual 24 hour 3 hour 1 hour	1.2 ppb 3 ppb 11 ppb 21 ppb	4% 2% 2%	5% 3% 8%
Ozone O_3	8 hour 1 hour	62 ppb 68 ppb	52% 85%	 85%
Particulate Matter PM_{10}	Annual 24 hour	13 $\mu g/m^3$ 28 $\mu g/m^3$	26% 19%	26% 19%
Fine Particulate Matter $PM_{2.5}$	Annual 24 hour	6 $\mu g/m^3$ 14 $\mu g/m^3$	40% 22%	

The State of North Dakota has also monitored SO_2 in Theodore Roosevelt National Park since 1980. These data show that SO_2 concentrations have been steady and well below the SO_2 NAAQS and NDAAQS from 1980 through 2002.

The EPA questioned compliance with the SO_2 PSD increments. The findings of two state public hearings indicated the North Dakota State Implementation Plan (SIP) is adequate to protect against air quality deterioration. Refer to the EPA (EPA, 2003) and the State of North Dakota (North Dakota Department of Health, 2003) for in-depth analysis.

Mercury Emissions

The EPA has identified emissions from coal-fired power plants as a significant source of atmospheric mercury (Hg). Potential impacts from Hg emissions include impacts to public health and to aquatic ecosystems.

Mercury emissions depend on coal chemistry and air pollution controls. Emissions from all reported sources in Mercer County, North Dakota, were 1,040 pounds of mercury compounds in 1999. Mercury emissions from coal-fired power plants in Mercer County, North Dakota, for 1999 were 310 pounds from the Basin Electric Power Cooperative and 113 pounds for the Great River Energy Stanton Station.

Mercury emissions from power plants are a significant source of anthropogenic mercury. Research by the University of North Dakota will evaluate Hg emissions and cost-effective control options to be applied to most coal-fired applications.

The public health impact of greatest concern is neuro-toxicity associated with ingestion of dietary methyl-mercury by pregnant women. Although consumption of fish is the primary cause for human and wildlife exposure to methyl-mercury, EPA does not advise the typical U.S. consumer of fish from restaurants and grocery stores to limit fish consumption.

Because Hg accumulates most efficiently in the aquatic food web, fish-eating birds and mammals are more highly exposed to Hg than any other known components of aquatic ecosystems. Adverse effects of Hg exposure to fish, birds and mammals include death, reduced reproduction, impaired growth and development, and behavioral abnormalities.

From the Freedom Mine, Coteau provides lignite to Basin Electric's Antelope Valley Station and Leland Olds Station. It also provides coal for Dakota Gasification Co.'s Great Plains Synfuels Plant. Until recently Coteau supplied Great River Energy's Stanton Station. The Stanton Station switched to subbituminous coal imported from Montana. Both units of the Antelope Valley Station are equipped with a spray dryer and baghouse for air pollution control. North Dakota Department of Health indicates 376 pounds. of mercury emissions in 1999 (Bachman 2005). Both units of the Leland Olds Station are equipped with an electrostatic precipitator for air pollution control. Mercury emissions in 1999 were 310 pounds. Basin Electric does burn a small amount of subbituminous coal at this facility. Unit 1 at the Stanton Station is equipped with an electrostatic precipitator, while Unit 10 is equipped with a spray dryer and baghouse. Mercury emissions in 1999 were 113 pounds (Bachman 2005). The boilers at the Great Plains Synfuels Plant are fired on a variety of waste products and byproducts (no coal) and are equipped with a scrubber (ammonia as the reagent) and a wet electrostatic precipitator.

There is one other power plant in Mercer County, North Dakota. The Coyote Station, which is just south of Beulah, gets its lignite from the South Beulah Mine which is operated by Dakota Westmoreland. It is equipped with a spray dryer and baghouse. Mercury emissions from Coyote Station were 260 pounds. in 1999 (Bachman 2005).

Total mercury emissions from coal combustion in power plants in North Dakota during 1999 is estimated at 1.024 tons (2048 pounds) (Bachman 2005).

Particulate Matter

The State of North Dakota has monitored PM_{10} concentrations near Beulah, North Dakota. since 1995 and $PM_{2.5}$ concentrations since 2000. These data show that PM_{10} concentrations have been below PM_{10} NAAQS from 1995 through 1998 and that $PM_{2.5}$ concentrations have been below $PM_{2.5}$ NAAQS from 2000 through 2002.

Visibility

The Inter-Agency Monitoring of Protected Visual Environments (IMPROVE) has measured visibility in national parks and wilderness areas in the United States since the 1980s. North Dakota's one IMPROVE station is located in Theodore Roosevelt National Park (installed in 1999). Visibility can be expressed in terms of deciviews (dV), a measure for describing perceived changes in visibility. One dV is defined as a change in visibility that is just perceptible to an average person.

Visibility data are calculated for each day, ranked from cleanest to haziest, and divided into three categories:

- 20 percent cleanest: mean visibility for the 20 percent of days with the best visibility
- average: the annual median visibility
- 20 percent haziest: mean visibility for the 20 percent of days with the poorest visibility

Preliminary analysis of the North Dakota station through May 2000 shows that average visibility is about 70 to 80

miles. This IMPROVE station has not operated long enough to determine a trend of improving or worsening visibility condition in Theodore Roosevelt National Park.

Summary of Existing Air Quality

Air quality monitoring and dispersion modeling show that air quality in the Freedom Mine region is generally good. Table 3.4 indicates air quality components along with comments on present situation.

3.5 WATER RESOURCES

Groundwater

Shallow groundwater occurs in unconfined aquifers—sandstone and lignite strata—of the Sentinel Butte Formation. The Beulah/Lower Beulah lignite, which is the focus of mining, is the thickest of the shallow lignites and forms a continuous bed over most of the WMA. This aquifer is the source for 17 wells in the WMA. The water is used for both domestic and livestock watering purposes. These wells can produce water in the range of one to 12 gallons per minute, with the majority flowing at three to seven gallons per minute. Water quality is highly variable.

Precipitation is the sole source of groundwater for uplands in WMA. North-central Mercer County receives about 17 inches of precipitation annually. Four-fifths (14 inches) of this comes as rainfall and one-fifth (three inches) as snowfall. In western North Dakota, annual evapotranspiration greatly exceeds total annual precipitation. The amount of precipitation infiltrating the ground is small compared to the percentage of precipitation lost to runoff, transpiration and evaporation. The rate of groundwater recharge is trivial because of low annual precipitation and the low hydraulic conductivity of surficial materials. Under natural conditions, the groundwater flow regime occurring within a layered sequence of till, silt, clay, and lignite is very slow and produces small vertical recharge rates. However, given a large enough area and enough time, precipitation can provide substantial amounts of water to local aquifers.

Table 3.4
Summary of Air Quality in the Freedom Mine Region

Air Quality Component	Comment
Climate	
Temperature	Temperatures in Beulah show no warming or cooling trend.
Precipitation	Very slight decrease in mean annual precipitation in Beulah (.05 inches)
Air Pollutant Concentrations	
Criteria Air Pollutants	• Concentrations in Beulah and Theodore Roosevelt National Park (TRNP) are in compliance with NAAQS and NDAAQS. • SO_2 concentrations are low and steady in TRNP. Compliance with the SO_2 PSD increments has been questioned, although monitored data appear to be below SO_2 PSD increments.
Visibility	
Badlands Wilderness	20% cleanest: 100 – 120 miles average: 70 – 80 miles 20% haziest: 30 – 40 miles
Theodore Roosevelt National Park	Average visibility about 70 – 80 miles
Atmospheric Deposition	
Wet Deposition	Precipitation pH > 5.0 in Theodore Roosevelt National Park from 1981 through 2001.
Dry Deposition	Data available only from 06 October 1998 through 04 January 1999
Total Sulfur Deposition	Deposition rates appear to be well below US Forest Service guidelines from 1981 through 2001

Surface Water

The WMA is divided into the watersheds of West Antelope Creek, Knife River, and Lake Sakakawea, all of which lie within the Missouri River drainage basin. The area does not contain perennial streams or natural lakes. Surface runoff drains eastward through Antelope Creek into the Knife River, northward along several tributaries into Lake Sakakawea at Beaver Creek Bay, and southward into Spring Creek and the Knife River. Local ephemeral and intermittent streams have peak flows as a result of snowmelt or summer thunderstorms. Annual runoff averages about one inch. Surface water is typically a sodium-sulfate type.

Forty-three pre-mining stock ponds are located within the WMA and are used for livestock watering. Stock pond configurations consist of dugouts and/or embankments and are fed by surface water runoff or a combination of surface water and springs. The number of stock ponds within the permit area is consistent with native grassland being the primary land use. No alluvial valley floors or floodplains are present.

3.6 SOILS

A wide range of soils exists in the WMA. A registered Professional Soil Classifier of North Dakota conducted a detailed soil survey of the proposed permit area. Soil mapping units are delineated and identified along with the depth of topsoil and subsoil of each unit that is suitable for saving and replacing during reclamation.

Soil series such as Amor, Cabba, Zahl, or complexes of these soils, commonly occupy steeper areas (25 percent+ slopes). The Amor and Cabba series are moderately deep and shallow soils, respectively, derived from underlying soft shale and sandstone bedrock. Zahl series is a shallow soil developed in a thin mantle of glacial till that overlies soft bedrock. These loamy soils possess low natural fertility and are used primarily as grazing lands.

Soil series such as Arnegard, Bowbells, Grail, Parshall, Shambo, Straw, Williams, or complexes of these soils, are found over much of the landscape of the WMA where gentle to moderate slopes exist. These soils have formed in wind or water deposited alluvial sediments and in glacial till. They possess high natural fertility and are used extensively for cropland. Steeper portions of these soils are commonly used for hay and pastureland.

Natural Resource Conservation Service-designated prime farmlands are present on approximately 1,022 acres throughout the proposed WMA. Of this total, approximately 143 acres of prime farmland overly federal coal tracts.

3.7 LAND USE/VEGETATION

The WMA lies in the Missouri Slope Vegetative Zone and ranges from flat ground to gently rolling hills, steeper hills dissected by valleys (trenches), wetlands, and shallow drainages. The primary land uses on federal coal tracts are cropland and native grassland as shown in Table 3.5.

Table 3.5
West Mine Area Land-Use Tabulations (Acres)

Land Use	Federal Coal Tracts	Entire Permit Area
Cropland	1,118.0 (20%)	5,325.6 (31%)
Native Grassland	3,982.2 (72%)	10,660.0 (63%)
Tame Pasture	176.9 (3%)	332.3 (2%)
Shelterbelt	11.6 (<1%)	41.2 (<1%)
Wetlands	67.0 (1%)	227.4 (1%)
Stockponds	3.5 (<1%)	12.6 (<1%)
Woodlands	172.7 (3%)	356.6 (2%)
Industrial	12.3 (<1%)	89.3 (<1%)
	5,544.2 acres	17,051.0 acres

Land uses and vegetation characteristics of federal coal tracts are similar to surrounding lands where cropland is intermixed with native prairie. Land uses and vegetation patterns reflect local and regional economic conditions along with climatic, geologic, and edaphic factors.

Vegetation surveys of native grasslands indicate that the range is in generally good condition. Common species include western wheatgrass, blue grama, green needlegrass, Junegrass, sedges, and forbes. No special-status plant species have been found in the study area. Although not specifically inventoried, invasive, non-native noxious weeds such as Canada thistle and leafy spurge are likely scattered throughout the WMA.

Wetlands cover nearly 230 acres of the WMA. They are found primarily along deep, dissected drainages. A majority of pothole-type wetlands are located off the federal coal tracts in Sections 15 and 21, T. 145 N., R. 88 W. Sixty-seven acres of Class 3 wetlands have been identified on the federal coal tracts of the WMA. These features were identified on color infrared photography acquired and interpreted by the U.S. Fish & Wildlife Service for a National Wetlands Inventory carried out between 1979 and 1984.

Five wetland seeps were located during a detailed soil survey conducted over the WMA. Three of the seeps are found in the southwestern part of the WMA and two in the north. The seeps range from one-tenth acre to about two acres in

size (5.25 total acres). One seep has characteristics of a fen. Fens are peat-forming (organic soil) wetlands that receive nutrients from sources other than precipitation, usually from upslope sources through drainage from surrounding mineral soils and from groundwater movement. Fen soils typically must have a surface organic horizon greater than 16 inches in thickness. They differ from bogs in that fens are less acidic and have higher nutrient levels. The seep in Section 6, T. 144 N., R. 88 W., which is about one-half acre in size, demonstrates the fen characteristics described above. The other four wetland seeps would be considered fen-like but not true fens.

3.8 WILDLIFE

Wildlife surveys of the WMA identified larger mammals including coyote, red fox, mule deer, white-tailed deer, pronghorn antelope, rabbit, raccoon, badger, porcupine, and skunk. Smaller mammals include the fox squirrel, weasel, ground squirrel, pocket gopher, and various species of mice and voles. No prairie dogs (a T&E candidate species) are known to exist in the WMA.

Amphibians and reptiles that might be found in the WMA include blotched tiger salamander, Great Plains toad, northern leopard frog, western painted turtle, rattlesnake, plains garter snake, and bull snake.

Avian surveys indicate this area is not used for nesting by eagles and used only minimally by other raptors. Red-tailed hawks and northern harriers are common migrant raptors found throughout the area. Bald and golden eagles have been seen flying around the Freedom Mine. Sharp-tailed grouse, wild turkey, gray partridge, and pheasants have been noted, but this area is outside the range of greater sage-grouse. The Migratory Bird Treaty Act puts special emphasis on those birds that use an area seasonally. Common migrants to west-central North Dakota recently observed in the WMA include mallard, blue-winged teal, mourning dove, willow flycatcher, eastern and western kingbird, robin, meadowlark, cedar waxwing, common yellowthroat, song sparrow, redwing blackbird, Brewer's blackbird, cowbird, and goldfinch. Some songbirds such as house sparrows, magpies, blue jays, and chickadees may be seen in the area year-round.

Detailed lists of wildlife observed on and in the vicinity of the WMA along with a discussion of wildlife can be found in Coteau's PAP submitted to the PSC.

The BLM consulted with the U.S. Fish and Wildlife Service (FWS) regarding threatened and endangered (T&E) species. The FWS responded by memo (March 29, 2002) that it wase not aware of any T&E species listed for Mercer County frequenting the WMA. The FWS concluded that it did not object to leasing the federal coal tracts, consistent with BLM's 1988 RMP. On July 7, 2003, the BLM requested an update from FWS on T&E consultation because over a year had passed since the initial correspondence. The BLM North Dakota Field Office received a reply from FWS (August 22, 2003) confirming its earlier conclusion. There were no FWS candidate (Dakota skipper butterfly) or sensitive (western burrowing owl, Baird's sparrow) species observed during wildlife surveys conducted within the past three and one-half years in the WMA.

Key wildlife habitats consisting of wooded draws, wooded shrub lands, and riparian habitats greater than approximately 40 acres in extent were placed in a category called Wildlife Threshold Acres in the coal planning section of the North Dakota RMP. The Antelope Coal Study Area (CSA), of which the WMA is a part, had 2,164 threshold acres identified within it. The RMP stated that up to half (1,082) of the threshold acres would be allowed to be leased without restrictions. There are approximately 780 wildlife threshold acres in the WMA. No other wildlife threshold acres have previously been leased in the Antelope CSA. Therefore, all wildlife threshold acres in the WMA would be available for leasing.

3.9 CULTURAL RESOURCES

A survey of the WMA was conducted in 1999 (Boughton et al. 1999). Two hundred fifty-one sites were recorded within the WMA, including 201 prehistoric and 50 historic period sites. Table 3.6 shows the distribution of prehistoric sites above federal coal within the WMA. The prehistoric sites consist of stone rings, cairns and alignment features, a few lithic scatters, a single petroglyph, burial, and effigy sites as explained in Appendix D (Archeological Features) and tabulated in Table 3.7.

Table 3.6
Prehistoric Sites Of The West Mine Area

Prehistoric Sites	Above Federal WMA	Above Federal Coal
National Register eligible	40	13
Not eligible	161	50
TOTAL	201	63

Following the 1999 survey, in 2000 a Testing and Evaluation Plan was developed for National Register of Historic Places (NRHP) evaluation of the prehistoric sites. The sites were tested that same year (Peterson et al. 2000; Boughton et al. 2001). This plan defined data gaps, developed a research design and defined the registration requirements to recommend prehistoric sites eligible for the NRHP under Criterion D. Criterion D is the ability of a site to yield, or

Table 3.7
Prehistoric Archeological Features within the West Mine Area

Prehistoric Features	Federal Coal	State Coal	PVT Coal	Total
Stone rings	444	86	755	1,285
Stone Cairns	167	86	152	405
Stone Alignments	13	1	7	21
Stone Lined Depressions	2	1	6	9
Effigy	1	0	0	1
Recorded Burial/Earthen Burial Mound	1	0	0	1
Others (Cultural Material Scatter/Petroglyph)	4	0	6	10
TOTALS	**632**	**174**	**926**	**1,732**

potentially yield, information important to prehistory or history. After the sites were tested in 2000, NRHP eligibility recommendations were made for prehistoric sites based on the Testing and Evaluation Plan criteria (Boughton et al. 2001). In addition to those recommendations that had been based on the plan criteria, sites with important individual features were also recommended as eligible. A total of 39 prehistoric sites were determined eligible under criterion D (Figure 3.1).

Historic period sites were also recorded during the archeological surveys (Boughton et al. 1999). These historical sites included farmsteads, depressions/foundations, windmills, quarry sites, a bridge, a pump, a mine and a couple of historic period cultural material scatters. After reviewing historical sources, only the Ricker farmstead, 32ME189, was recommended eligible to the NRHP under Criterion C because it reflected traditional German-Russian methods of construction.

In addition to the prehistoric sites having archeological significance and the historic period site with significant architecture, a Traditional Cultural Property (turtle effigy) was also identified. Elders of the Three Affiliated Tribes and the Standing Rock Sioux brought the site to the BLM's attention.

Prehistoric sites within the WMA include: 1,721 stone features (rings, cairns, alignments, effigy, lined depressions), three known burial sites, and the possibility of other unmarked burial sites (Table 3.7). All these features have continuing importance to prehistorians and American Indian communities with historic ties to the area.

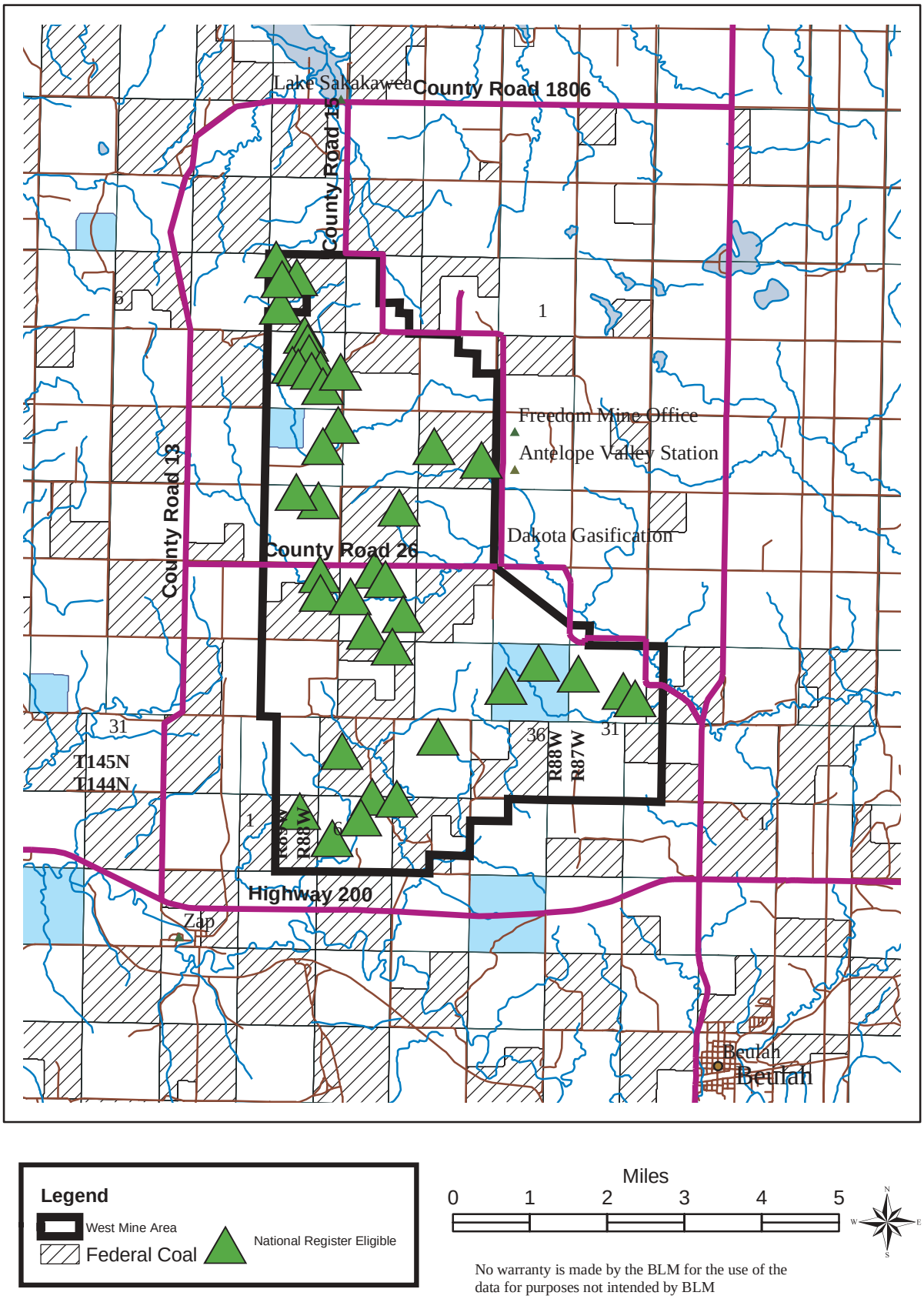
The context for the archeological resources is the in North Dakota State Plan for archeological sites, which was developed as a general historic context for archaeological sites in the state. The plan summarizes existing information, identifies gaps in the data and provides research topics. The primary purpose was to "facilitate the identification of 'Historic Properties,' i.e., cultural sites or properties eligible for listing on the National Register of Historic Places" (State Historic Society of North Dakota-Archaeology and Historic Preservation [SHSND-AHP] 1990:A.1). The portion of the State Plan pertinent to the WMA is the Knife River Study Unit.

Since 1979, approximately 50,540 acres have been investigated for cultural resources in what is identified as the Coteau Mining Region (Figure 3.2). This region includes the WMA, areas previously mined, and areas currently surveyed for future mining operations. Three hundred sixty-seven prehistoric sites have been identified and data recovery has been performed at 19 sites previously impacted by mining. Perhaps more is known about the archaeological features associated with the Coteau Mining Region than anywhere else in North Dakota.

The region is part of the glaciated subsection of the Missouri Plateau and is distinguished by rolling uplands covered in glacial till. A number of Pleistocene-age glacial advances deposited successive till layers along with glacial erratics across an erosional relief dominated by Tertiary bedrock (Wyckoff and Kuehn 1983:160).

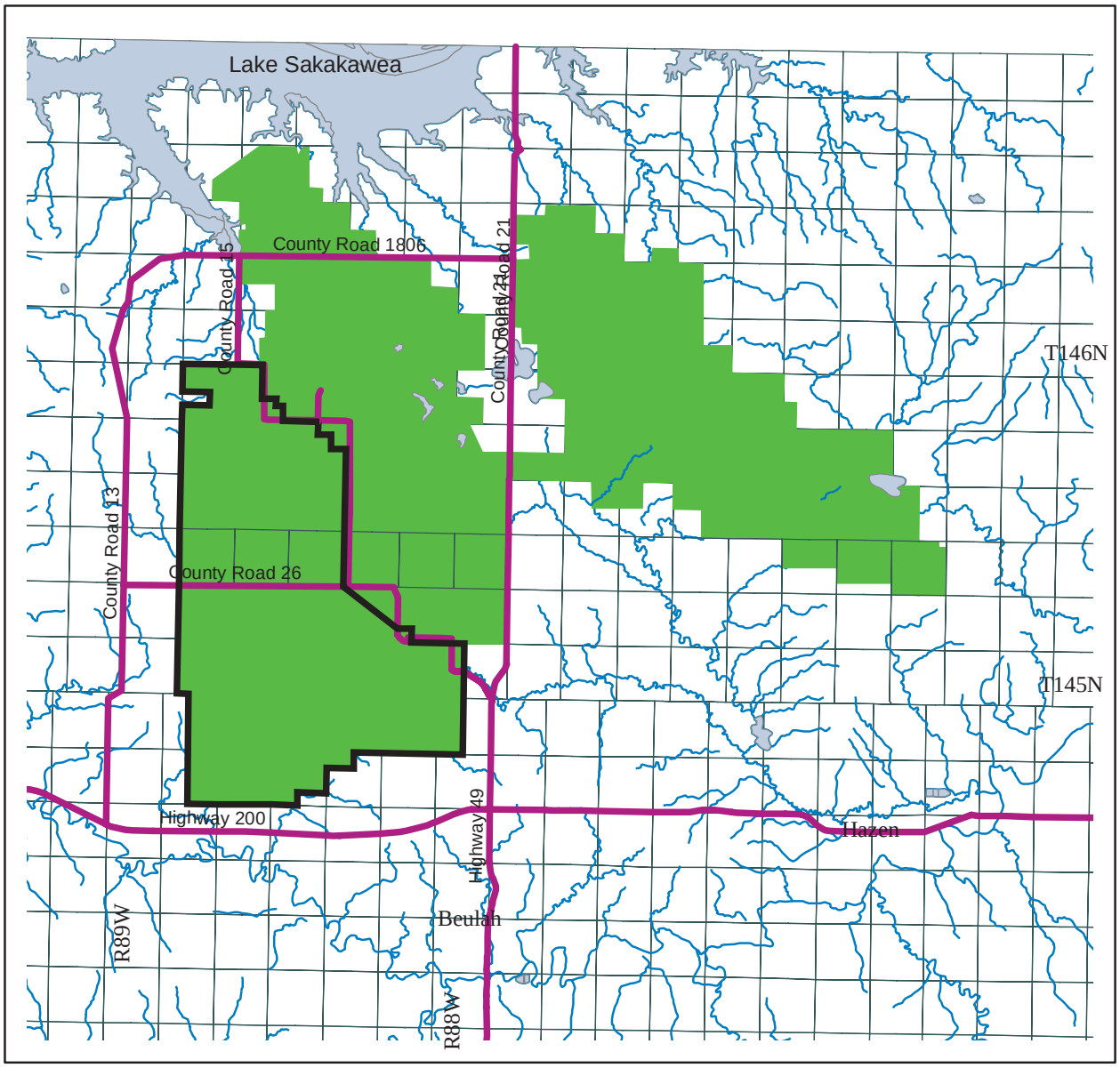
The most noticeable natural feature in the Coteau Mining Region is the Beulah Trench. The Beulah Trench lies roughly 100 feet below the surrounding uplands. The trench runs in a southeast to northwest direction; its northern terminus marked by Beaver Creek. Approximately four miles north of Beulah, the trench splits into the Hazen Branch to the east and the Zap Branch to the west. The Hazen Branch borders a major portion of the WMA's southern boundary. The Beulah Trench and Knife River valley apparently served

Figure 3.1
West Mine Area Showing National Register Eligible Historic Properties



No warranty is made by the BLM for the use of the data for purposes not intended by BLM

Figure 3.2
Coteau Mining Region



Legend
Coteau Mine Region
West Mine Area

Miles
0 1 2 3 4 5

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W E
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No warranty is made by the BLM for the use of the data for purposes not intended by BLM

as an ice marginal route of the Missouri. As the ice continued to melt, a more easterly course was followed, and the Beulah Trench segment was abandoned (Carlson 1973:49-51). Surveys of the Coteau Mining Region reveal a high density of prehistoric habitation sites near the trench (Boughton et al. 1994; Deaver and Schweigert 1988:41-42).

Overall, within the Coteau Mining Region there is an average of 6.3 sites per 1,000 acres (one site for every 159 acres surveyed). The area to the east of the Beulah Trench has a significantly lower site density (4.6 sites/1,000 acres surveyed) than the area investigated to the west of the Beulah Trench (11 sites/1,000 acres surveyed). The reason for this difference is presently unclear. It was originally believed the difference resulted from a recording bias due to a higher percentage of plowed fields in the area east of the Beulah Trench. However, if this were the case, one might expect that the density of lithic scatters and other cultural material would be higher to the east of the trench than to the west. This is not the case.

An alternative explanation may be related to topographic differences between the areas investigated to the east versus the west sides of the trench. The average topographic diversity for sites (based on the number of contour lines within one mile of the site) located east of the trench is 9.25 contour lines (92.5 feet). The average topographic diversity associated with sites to the west of the trench is 15.24 contour lines, or 152.3 feet. Previous investigations have noted a tendency for increased utilization of bluff/terrace edges (K. Deaver 1980a and b, 1983a; Deaver and Morter 1981). These locations represent ecotonal situations where the resources of both lowlands (riparian floral and faunal communities) and uplands (floral and faunal communities of the river breaks) are accessible. The increased topographic diversity may mark the presence of ecotonal environments as preferred localities for occupation.

The cultural components that have been identified in the Coteau Mining Region and the potential of future investigations to contribute to our understanding of past lifeways are detailed in Appendix C (Prehistoric Context). In general, the Coteau Mining Region has been occupied, at least intermittently, for the past 6,000 years. The best temporal data is derived from 20 radiocarbon dates from features within stone ring sites, but the majority of the chronological information comes from the typological cross-dating of projectile points. This information indicates that the majority of features are associated with the archeologically-defined Besant Complex of the Plains Woodland tradition/Late Prehistoric Period (Deaver and Brownell 1992). This complex may have begun as early as 3,000 years ago and continued until 800 years ago.

At the same time the surveys and testing were being conducted, regional American Indian cultural resource specialists were invited to examine the sites and provide information pertinent to eligibility as Traditional Cultural Properties (Deaver 2001). The Assiniboine, Chippewa, Mandan, Hidatsa, Arikara, Cheyenne, and Yanktonai have claims to be original inhabitants of modern-day North Dakota while the Cree, Dakota, and Lakota have spent time in the state (Boughton 1999; Deaver 2001; Schneider 1994,).

The imprint of past peoples is found on the WMA landscape mainly in the form of stone features: rings, cairns, alignments, an effigy and a petroglyph. These stone features, which dot the landscape, mark locations used by the predecessors and ancestors of the Mandan, Arikara, Hidatsa and, later, the Yanktonai Sioux and other nomadic groups who moved into the area in the 1700s (Schneider 1994). The Mandan, Arikara, and Hidatsa (Three Affiliated Tribes) are current residents of the Fort Berthold Reservation, and the descendents of the Yanktonai largely reside on the Standing Rock and Fort Peck Reservations. Today, the Assiniboine live primarily on the Fort Belknap and Fort Peck Reservations in Montana, while the descendants of the other Siouian groups who moved through the project area are found on various reservations throughout the Dakotas.

In June of 2000, Ethnoscience, Inc. was contracted by Coteau to conduct investigations and provide recommendations regarding Traditional Cultural Values for the WMA and adjacent mine extension areas. That report was completed in September of 2001 (Deaver 2001). Portions of that text are presented in Appendix E (American Indian Traditional Cultural Values). Tribal representatives had conversations concerning the WMA with federal agencies, SHPO, and the PSC earlier that year. On April 11, 2000, the Standing Rock Sioux Tribe's THPO facilitated a meeting in Bismarck which began a series of meetings/consultation meetings, site visits, individual consultations, conversations, and correspondence concerning the WMA that continue today (see Chapter 5 Consultation and Coordination).

Fort Berthold's Three Affiliated Tribes, Fort Peck's Assiniboine and Sioux, and the Standing Rock Sioux Tribe have participated in consultation, as have the BLM, OSM, PSC, North Dakota State Historic Preservation Officer, Coteau, the National Trust for Historic Preservation, and the Advisory Council On Historic Preservation. Other American Indian tribes consulted include: Fort Belknap, Oglala Sioux Tribe, Rosebud Sioux Tribe, Santee Sioux Tribe of Nebraska, Yankton Sioux Tribe, Flandreau Santee Sioux Tribe, Turtle Mountain Band of Chippewa Indians, Northern Cheyenne Tribe, Crow Creek Sioux Tribes, and Lower Brule.

Most interviewed tribal specialists embrace a world view that emphasizes the interrelationships between the past and present, the living and dead, people and the environment, and the spiritual and physical aspects of life. Time, from this perspective, is not only a chronological ordering of events but also has a quality and texture, which continues

into the present and future. Time, or more accurately tradition, establishes the rationale and basis for living in the proper fashion. From this perspective, there is often an intimate relationship between a person and his past. Time, or the past, provides a template for the proper way of life. It legitimizes the present by showing it is related to things that have gone before.

The location of a cultural place/site is interpreted as evidence that ancestors recognized the physical and spiritual characteristics of the landscape, which made it an appropriate place to camp, fish, hunt, gather, fast, and so on. Because Indian people today can still recognize these same physical and spiritual characteristics of the landscape, there is a continuing tie between the people and the landscape and the people who created the site and those who view it today. It is this sense of relationship that is important.

Because perpetuation of the cultural relationship is highly valued, cultural places/sites must be shown respect, and visiting them, praying and making offerings may periodically renew the tie to these places on the landscape. In other words, these cultural places become the focus of pilgrimages. The spiritual and physical attributes of a place, as well as its traditional cultural use, are important qualities of cultural places that transcend time.

All of the tribal consultants have repeatedly stated that all of the sites within the project area are culturally important, have traditional cultural associations, or are sacred.

3.10 ENVIRONMENTAL JUSTICE

Environmental justice (Executive Order 12898) refers to the fair treatment and meaningful involvement of people of all races, cultures and incomes with respect to the development, implementation and enforcement of environmental laws, regulations, programs and policies. Its focus is to avoid disproportionately high and adverse human health or environmental effects on minority and/or low-income populations. Black/African American, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut and other non-white persons are defined as minority populations by the Interagency Working Group convened under the auspices of the Executive Order. Low-income populations are defined as persons living below the poverty level based on total income of $16,700 for a family household of four based on the 2000 census.

None of the defined minority populations represented more than three percent of the population in Mercer County based on 2000 census figures. However, four Indian reservations have their administrative centers in North Dakota, one located in North Dakota but predominantly in South Dakota, and one with an interest in the study area located in eastern Montana. The 2000 American Indian populations of these reservations were: Fort Berthold, 3,986; Spirit Lake (also known as Fort Totten), 3,317; Standing Rock, 5,964; Turtle Mountain, 8,009; Lake Traverse (also known as Sisseton), 3,453; and Fort Peck, 6,391**.** All but one of these reservations had 1999 family poverty levels in excess of 30 percent. These figures are compared to state family poverty levels of 8.3 for North Dakota, 10.5 for Montana, and 9.3 for South Dakota.

The Fort Berthold Reservation, home to the Three Affiliated Tribes, is located adjacent to the WMA, with a small portion in Mercer County. Fort Berthold is located in west-central North Dakota and covers approximately 12,284 square miles in six counties: McLean, Mercer, Dunn, Mountrail, McKenzie, and Ward. The Missouri River traverses the middle of the reservation and divides the reservation into three separate areas. The total land area of the reservation is 988,000 acres with 457,837 acres in tribal and individual Indian ownership. The major economic occupation on the Fort Berthold Reservation is cattle ranching and farming. Currently, the Three Affiliated Tribes, Fort Berthold Community College, Bureau of Indian Affairs, the Indian Health Service and the Four Bears Casino and Lodge provide the majority of employment. The 1999 family poverty level rate was 31 percent compared for a figure of 8.3 for the state of North Dakota as a whole.

Mercer County had a 1999 family poverty level of 5.5, compared to the state level of 8.3. The average per capita income was $18,256 for Mercer County, compared to $17,769 for the state as a whole.

3.11 SOCIOECONOMICS

Social

The population of Mercer County was 8,664 in 2000. This represented a decline of nearly 12 percent since 1990 due to migration from the area. The county population is projected to continue to slowly decline until 2020. The Freedom Mine began operating in 1983. The communities closest to the mine are Beulah and Hazen. Beulah had a 2000 population of 3,152 and Hazen had a 2000 population of 2,457. The scoping comments from Mercer County, Beulah and Hazen were positive toward the mine's effects on the area.

The 2000 American Indian population of the Fort Berthold Reservation, which is located adjacent to the WMA, was 3,986. Consultation has been ongoing with representatives of the Three Affiliated Tribes, whose home is the Fort Berthold Reservation. Indian cultural representatives and elders have expressed concerns about the cumulative effects of mining operations on their communities (Deaver, 2001).

Economics

The lignite industry, including the four operating mines, the electricity generating facilities and the gasification/synfuels plant, are located in the "Lignite Triangle" running from Underwood to Beulah to Center, in McLean, Mercer, and Oliver Counties. Lignite production has averaged about 30 million tons in the past 10 years. The Freedom Mine produces 15 million tons on average, half of the total.

Coal mining and coal conversion are basic industries, those which bring money into the state, support and create jobs in other sectors of the local and regional economy (Coon and Lestritz, 2003). The energy sector, which includes petroleum and natural gas extraction, exploration, and refining, accounts for 45 percent of sales in 2000 for State Planning Region 7 (Coon and Lestritz, 2001). Planning Region 7 includes the coal mining counties of Mercer, Oliver, and McClean and the Bismarck Trade Center.

The wages paid in the coal mining industry are among the highest in the state. The annual salaries reported to the Job Service of North Dakota were $62,925 in 2000 compared to a statewide average of $24,683. The comparable figures for Mercer County were $61,514 and $36,122 in 2000 (Coon and Lestritz, 2002).

The coal mining industry contributes substantially to local and state tax revenues including personal and corporate income taxes, sales and use taxes, energy conversion taxes, and coal severance taxes (Table 3.8). Coal severance taxes are a particularly important source of revenue at the county level. The tax is currently 37.5 cents per ton of which 70 percent is distributed to the coal-producing counties. Since 2001, the tax revenue is further apportioned as follows: 40 percent to the county general fund; 30 percent to the cities within the county; and 30 percent to the school districts (North Dakota Office of the State Tax Commissioner, 2002). Over this period, the Freedom Mine has accounted for 91.9 percent of the average annual production.

Table 3.8
Mercer County Coal Production and Severance Taxes

	County Share[1]	
Calendar Year	Million Tons	Severance Tax (Million Dollars)
1997	17.05	4.48
1998	17.6	4.62
1999	17.3	4.54
2000	16.5	4.33
2001	16.8	4.41
2002	17.35	4.55
2003	17.41	4.57

[1] From 1997 to 2001, the severance tax was 75 cents per ton and the counties were allocated 35 percent. After 2001, the tax was reduced to 37.5 cents per ton but the counties' share was increased to 70 percent.

The importance of coal mining, employment, and severance taxes to the local communities is represented by the following statements: Within the Beulah School District, coal severance taxes provided 12 percent ($689,000) of the total budget for the 2002-2003 school year; 15 percent of the total enrollment of has a parent working at the Freedom Mine (Volesky 2004). In the adjacent Hazen School District, coal severance taxes provided 12 percent ($574,000) of the total budget for the 2002-2003 school year; 12 percent of the Hazen student body (88 students) have a parent working at the Freedom Mine (Ness 2004). Coal severance taxes also provided 45 percent ($520,000) of the 2003 general fund operating budget for the City of Hazen (Adler 2004).

Federal production has historically been a smaller share of Mercer County production than statewide production. The federal share of coal production is shown in Table 3.9 (Mineral Management Service 2004).

Federal coal production also contributes to state revenues through the 50 percent share of federal coal royalties disbursed to the state annually (Table 3.10). The federal royalties paid averaged slightly more than one million dollars per year. The state share is distributed according to criteria set by state legislation. The mine data in Table 3.10 is combined to avoid disclosure of individual lease data (Minerals Management Service, 2004).

In summary, the direct and indirect employment and the income and taxes generated by coal mining are important to the local and state governments and the local and regional economy. While coal mining is important to North Dakota's economy, federal coal production accounted for less than nine percent of the total state production, and only 4.5 percent of the Mercer County production for the years 1997-2001.

Table 3.9
Federal Coal Production Share (In Million Of Tons)

	North Dakota			Mercer County		
Yr.*	**Total**	**Federal**	**%**	**Total**	**Federal**	**%**
97	29.77	3.313	11.1	16.77	1.234	7.4
98	29.55	2.476	8.4	17.57	.854	4.9
99	30.93	2.223	7.2	17.78	.383	2.2
00	31.16	2.904	9.3	16.46	.609	3.7
01	30.50	2.511	8.2	16.32	.724	4.4
02	30.9	2.147	7.0	17.63	Not Available	

*Federal Fiscal Year

Table 3.10
Federal Coal Production and Royalties

	Sales Volume (Million Tons)	**Royalties (Million Dollars)**
1997	3.313	1.183
1998	2.476	1.164
1999	2.223	1.041
2000	2.904	1.170
2001	2.511	1.541